



# Facts About Dietary Supplements

Clinical Nutrition Service, Warren Grant Magnuson Clinical Center • Office of Dietary Supplements •  
National Institutes of Health

## Vitamin E

*As a consumer, you need information you can trust to help you make thoughtful decisions about eating a healthful diet and using vitamin and mineral supplements. Registered dietitians at the Warren Grant Magnuson Clinical Center, the clinical research hospital at the National Institutes of Health (NIH) in Bethesda, MD, developed this series of Fact Sheets in conjunction with the Office of Dietary Supplements in the Office of the Director of NIH to provide responsible information about the role of vitamins and minerals in health and disease and to help guide your decisions on the use of vitamin and mineral supplements. Each fact sheet in this series received extensive scientific review by recognized experts from the academic and research communities.*

*The information is not intended to be a substitute for professional medical advice. It is important that you seek the advice of a physician about any medical condition or symptom. It is also important to seek the advice of a physician, registered dietitian, pharmacist, or other qualified health care professional about the appropriateness of taking dietary supplements and their potential interactions with medications.*

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### **Vitamin E: What is it?**

Vitamin E is a fat-soluble vitamin that exists in eight different forms. Each form has its own biological activity, the measure of potency or functional use in the body (1). Alpha-tocopherol is the most active form of vitamin E in humans, and is a powerful biological antioxidant (2,3). Antioxidants such as vitamin E act to protect your cells against the effects of free radicals, which are potentially damaging by-products of the body's metabolism. Free radicals can cause cell damage that may contribute to the development of cardiovascular disease and cancer. Studies are underway to determine whether vitamin E might help prevent or delay the development of those chronic diseases (2,3).

### **What foods provide vitamin E?**

Vegetable oils, nuts, and green leafy vegetables are the main dietary sources of vitamin E. Fortified cereals are also an important source of vitamin E in the United States. The table of selected food sources of vitamin E suggests foods that contain vitamin E (4).

### **What is the Recommended Dietary Allowance for vitamin E for adults?**

The Recommended Dietary Allowance (RDA) is the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all (97-98%) healthy individuals in each life-stage and gender group (5). The 2000 RDAs for vitamin E (5) for adults, in milligrams (mg) and International Units (IUs) are:

Life Stage	Men	Men and Women	Pregnancy	Lactation
Ages 19+		15 mg* or 22 IU		
All Ages			15 mg* or 22 IU	19 mg* or 28 IU
<i>*1 mg alpha-tocopherol equivalents = 1.5 IU</i>				

The RDA for vitamin E is based on the alpha-tocopherol form because it is the most active, or usable, form (5, 6). Unlike other vitamins, the form of alpha-tocopherol made in the laboratory and found in supplements is not identical to the natural form, and is not quite as active as the natural form.

Results of two national surveys, the National Health and Nutrition Examination Survey (NHANES III 1988-91) and the Continuing Survey of Food Intakes of Individuals (1994 CSFII) indicated that the dietary intake of most Americans does not provide the recommended intake for vitamin E. However, a 2000 Institute of Medicine (IOM) report on vitamin E states that intake estimates of vitamin E may be low because energy and fat intake is often underreported in national surveys and because the kind and amount of fat added during cooking is often not known (5). The IOM states that most North American adults get enough vitamin E from their normal diets to meet current recommendations (5). However, they do caution individuals who consume low fat diets because vegetable oils are such a good dietary source of vitamin E. “Low-fat diets can substantially decrease vitamin E intakes if food choices are not carefully made to enhance alpha-tocopherol intakes” (5).

### **When can vitamin E deficiency occur?**

Vitamin E deficiency is rare in humans. There are three specific situations when a vitamin E deficiency is likely to occur. It is seen in persons who cannot absorb dietary fat, has been found in premature, very low birth weight infants (birth weights less than 1500 grams, or 3 1/2 pounds) (3,6), and is seen in individuals with rare disorders of fat metabolism (9). A vitamin E deficiency is usually characterized by neurological problems due to poor nerve conduction.

### **Who may need extra vitamin E to prevent a deficiency?**

Individuals who cannot absorb fat may require a vitamin E supplement because some dietary fat is needed for the absorption of vitamin E from the gastrointestinal tract. Anyone diagnosed with cystic fibrosis, individuals who have had part or all of their stomach removed, and individuals with malabsorptive problems such as Crohn's disease may not absorb fat and should discuss the need for supplemental vitamin E with their physician (3). People who cannot absorb fat often pass greasy stools or have chronic diarrhea.

Very low birth weight infants may be deficient in vitamin E (3, 6). These infants are usually under the care of a neonatologist, a pediatrician specializing in the care of newborns, who evaluates and treats the exact nutritional needs of premature infants.

Abetalipoproteinemia is a rare inherited disorder of fat metabolism that results in poor absorption of dietary fat and vitamin E (9). The vitamin E deficiency associated with this disease causes problems such as poor transmission of nerve impulses, muscle weakness, and degeneration of the retina that can cause blindness (10). Individuals with abetalipoproteinemia may be prescribed special vitamin E supplements by a physician to treat this disorder.

### **What are some current issues and controversies about vitamin E?**

#### *Vitamin E and heart disease*

Preliminary research has led to a widely held belief that vitamin E may help prevent or delay coronary heart disease (11). Researchers are fairly certain that oxidative modification of LDL-cholesterol (sometimes called "bad" cholesterol) promotes blockages in coronary arteries that may lead to atherosclerosis and heart attacks. Vitamin E may help prevent or delay coronary heart disease by limiting the oxidation of LDL-cholesterol (12). Vitamin E also may help prevent the formation of blood clots, which could lead to a heart attack. Observational studies have associated lower rates of heart disease with higher vitamin E intake. A study of approximately 90,000 nurses suggested that the incidence of heart disease was 30% to 40% lower among nurses with the highest intake of vitamin E from diet and supplements. The range of intakes from both diet and supplements in this group was 21.6 to 1,000 IU (32 to 1,500 mg), with the median intake being 208 IU (139 mg) (13). A 1994 review of 5,133 Finnish men and women aged 30 - 69 years suggested that increased dietary intake of vitamin E was associated with decreased mortality (death) from heart disease (14). But even though these observations are promising, randomized clinical trials raise questions about the role of vitamin E supplements in heart disease. The Heart Outcomes Prevention Evaluation (HOPE) Study followed almost 10,000 patients for 4.5 years who were at high risk for heart attack or stroke (15). In this intervention study the subjects who received 265 mg (400) IU of vitamin E daily did not

experience significantly fewer cardiovascular events or hospitalizations for heart failure or chest pain when compared to those who received a sugar pill. The researchers suggested that it is unlikely that the vitamin E supplement provided any protection against cardiovascular disease in the HOPE study. This study is continuing, to determine whether a longer duration of intervention with vitamin E supplements will provide any protection against cardiovascular disease (5).

#### *Vitamin E and cancer*

Antioxidants such as vitamin E help protect against the damaging effects of free radicals, which may contribute to the development of chronic diseases such as cancer (5). Vitamin E also may block the formation of nitrosamines, which are carcinogens formed in the stomach from nitrites consumed in the diet. It also may protect against the development of cancers by enhancing immune function (16). Unfortunately, human trials and surveys that tried to associate vitamin E with incidence of cancer have been generally inconclusive.

Some evidence associates higher intake of vitamin E with a decreased incidence of prostate cancer and breast cancer (17). However, an examination of the effect of dietary factors, including vitamin E, on incidence of postmenopausal breast cancer in over 18,000 women from New York State did not associate a greater vitamin E intake with a reduced risk of developing breast cancer (18).

A study of women in Iowa provided evidence that an increased dietary intake of vitamin E may decrease the risk of colon cancer, especially in women under 65 years of age (19). On the other hand, vitamin E intake was not statistically associated with risk of colon cancer in almost 2,000 adults with cancer who were compared to controls without cancer (20). At this time there is limited evidence to recommend vitamin E supplements for the prevention of cancer.

#### *Vitamin E and cataracts*

Cataracts are growths on the lens of the eye that cloud vision. They increase the risk of disability and blindness in aging adults. Antioxidants are being studied to determine whether they can help prevent or delay cataract growth. Observational studies have found that lens clarity, which is used to diagnose cataracts, was better in regular users of vitamin E supplements and in persons with higher blood levels of vitamin E (21). A study of middle aged male smokers, however, did not demonstrate any effect from vitamin E supplements on the incidence of cataract formation (22). The effects of smoking, a major risk factor for developing cataracts, may have overridden any potential benefit from the vitamin E, but the conflicting results also indicate a need for further studies before researchers can confidently recommend extra vitamin E for the prevention of cataracts.

### **What is the health risk of too much vitamin E?**

The health risk of too much vitamin E is low (23). A recent review of the safety of vitamin E in the elderly indicated that taking vitamin E supplements for up to four months at doses of 530 mg or 800 IU (35 times the current RDA) had no significant effect on general health, body weight, levels of body proteins, lipid levels, liver or kidney function, thyroid hormones, amount or kinds of blood cells, and bleeding time (24). Even though this study provides evidence that taking a vitamin E supplement containing 530 mg or 800 IU for four months is safe, the long term safety of vitamin E supplementation has not been tested. The Institute of Medicine has set an upper tolerable intake level for vitamin E at 1,000 mg (1,500 IU) for any form of supplementary alpha-tocopherol per day because the nutrient can act as an anticoagulant and increase the risk of bleeding problems. Upper tolerable intake levels “represent the maximum intake of a nutrient that is likely to pose no risk of adverse health effects in almost all individuals in the general population” (5).

### **Table of Selected Food Sources of Vitamin E (4)**

As the 2000 Dietary Guidelines for Americans state, “Different foods contain different nutrients. No single food can supply all the nutrients in the amounts you need” (25). The following table lists selected sources of vitamin E. As the tables indicate, vegetable oils, nuts, and green leafy vegetables are good dietary sources of vitamin E. Including these foods in your diet will help you meet your daily need for vitamin E, but it is still important to moderate total fat intake as recommended by the Dietary Guidelines for Americans.

Food manufacturers fortify many foods with vitamins and minerals. It is important to read the nutrition facts panel of the food label to determine whether a food provides vitamin E. If you want more information about building a healthful diet, refer to the Dietary Guidelines for Americans and the Food Guide Pyramid.

**Table of Selected Food Sources of Vitamin E**

<i>Food</i>	<i>International Units</i>	<i>% DV*</i>
Wheat germ oil, 1 Tb	26.2	90
Almonds, dry roasted, 1 oz	7.5	25
Safflower oil, 1 Tb	4.7	15
Corn oil, 1 Tb	2.9	10
Soybean oil, 1 Tb	2.5	8
Turnip greens, frozen, boiled, 1/2 c	2.4	8
Mango, raw, without refuse, 1 fruit	2.3	8
Peanuts, dry roasted, 1 oz	2.1	8
Mixed nuts w/ peanuts, oil roasted, 1 oz	1.7	6
Mayonnaise, made w/ soybean oil, 1 Tb	1.6	6
Broccoli, frozen, chopped, boiled, 1/2 c	1.5	6
Dandelion greens, boiled, 1/2 c	1.3	4
Pistachio nuts, dry roasted, 1 oz	1.2	4
Spinach, frozen, boiled, 1/2 c	0.85	2
Kiwi, 1 medium fruit	0.85	2

\*DVs are reference numbers based on the Recommended Dietary Allowance (RDA). They were developed to help consumers determine if a food contains a lot or a little of a specific nutrient. The DV for vitamin E is 30 International Units (or 20 mg). The percent DV (%DV) listed on the nutrition facts panel of food labels tells adults what percentage of the DV is provided by one serving. Percent DVs are based on a 2,000-calorie diet. Your Daily Values may be higher or lower depending on your calorie needs. Foods that provide lower percentages of the DV will contribute to a healthful diet.

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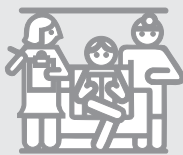
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